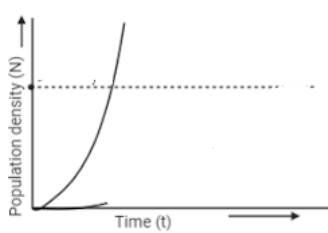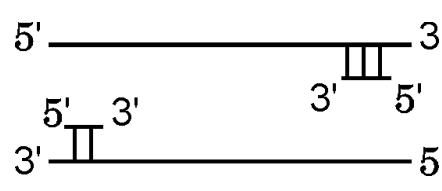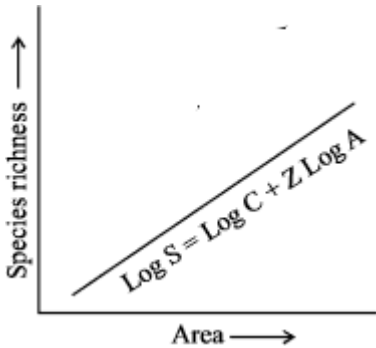|	**Marking Scheme** **Strictly Confidential** **(For Internal and Restricted use only)** **Senior Secondary School Certificate Examination,2024** **SUBJECT NAME BIOLOGY (Q.P. CODE 57/3/3)**
General Instructions: -	

1	You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested that before starting evaluation, you must read and understand the spot evaluation guidelines carefully.
2	**"Evaluation policy is a confidential policy as it is related to the confidentiality of the examinations conducted, Evaluation done and several other aspects. Its' leakage to public in any manner could lead to derailment of the examination system and affect the life and future of millions of candidates. Sharing this policy/document to anyone, publishing in any magazine and printing in News Paper/Website etc may invite action under various rules of the Board and IPC."**
3	Evaluation is to be done as per instructions provided in the Marking Scheme. It should not be done according to one's own interpretation or any other consideration. Marking Scheme should be strictly adhered to and religiously followed. **However, while evaluating, answers which are based on latest information or knowledge and/or are innovative, they may be assessed for their correctness otherwise and due marks be awarded to them. In class-XII, while evaluating two competency-based questions, please try to understand given answer and even if reply is not from marking scheme but correct competency is enumerated by the candidate, due marks should be awarded.**
4	The Marking scheme carries only suggested value points for the answers These are in the nature of Guidelines only and do not constitute the complete answer. The students can have their own expression and if the expression is correct, the due marks should be awarded accordingly.
5	The Head-Examiner must go through the first five answer books evaluated by each evaluator on the first day, to ensure that evaluation has been carried out as per the instructions given in the Marking Scheme. If there is any variation, the same should be zero after delibration and discussion. The remaining answer books meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.
6	Evaluators will mark(√) wherever answer is correct. For wrong answer CROSS 'X" be marked. Evaluators will not put right (✓) while evaluating which gives an impression that answer is correct and no marks are awarded. **This is most common mistake which evaluators are committing.**
7	If a question has parts, please award marks on the right-hand side for each part. Marks awarded for different parts of the question should then be totaled up and written in the left-hand margin and encircled. This may be followed strictly.

8	If a question does not have any parts, marks must be awarded in the left-hand margin and encircled. This may also be followed strictly.
9	If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out with a note **"Extra Question"**.
10	No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
11	A full scale of marks 0 to 70 marks has to be used. Please do not hesitate to award full marks if the answer deserves it.
12	Every examiner has to necessarily do evaluation work for full working hours i.e., 8 hours every day and evaluate 20 answer books per day in main subjects and 25 answer books per day in other subjects (Details are given in Spot Guidelines).This is in view of the reduced syllabus and number of questions in question paper.
13	Ensure that you do not make the following common types of errors committed by the Examiner in the past:- ● Leaving answer or part thereof unassessed in an answer book. ● Giving more marks for an answer than assigned to it. ● Wrong totaling of marks awarded on an answer. ● Wrong transfer of marks from the inside pages of the answer book to the title page. ● Wrong question wise totaling on the title page. ● Wrong totaling of marks of the two columns on the title page. ● Wrong grand total. ● Marks in words and figures not tallying/not same. ● Wrong transfer of marks from the answer book to online award list. ● Answers marked as correct, but marks not awarded. (Ensure that the right tick mark is correctly and clearly indicated. It should merely be a line. Same is with the X for incorrect answer.) ● Half or a part of answer marked correct and the rest as wrong, but no marks awarded.
14	While evaluating the answer books if the answer is found to be totally incorrect, it should be marked as cross (X) and awarded zero (0)Marks.
15	Any unassessed portion, non-carrying over of marks to the title page, or totaling error detected by the candidate shall damage the prestige of all the personnel engaged in the evaluation work as also of the Board. Hence, in order to uphold the prestige of all concerned, it is again reiterated that the instructions be followed meticulously and judiciously.
16	The Examiners should acquaint themselves with the guidelines given in the "**Guidelines for Spot Evaluation**" before starting the actual evaluation.
17	Every Examiner shall also ensure that all the answers are evaluated, marks carried over to the title page, correctly totaled and written in figures and words.
18	The candidates are entitled to obtain photocopy of the Answer Book on request on payment of the prescribed processing fee. All Examiners/Additional Head Examiners/Head Examiners are once again reminded that they must ensure that evaluation is carried out strictly as per value points for each answer as given in the Marking Scheme.

MARKING SCHEME
Senior Secondary School Examination, 2024
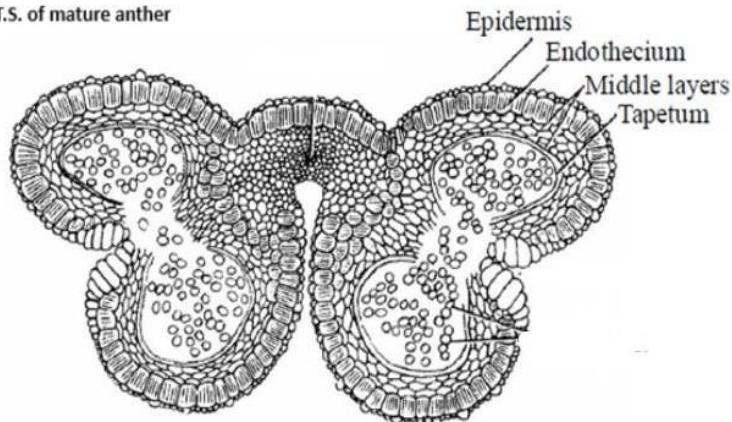### BIOLOGY (Subject Code–044)
[Paper Code: 57/3/3]

1	(C)/ Mango	1	1
2.	(B) / Spores	1	1
3.	(B)/ 2n, n	1	1
4.	(D)/ 2680	1	1
5.	(A)/ less in number	1	1
6.	(B)/ Down's syndrome	1	1
7.	(C) /50% pink : 50% white	1	1
8.	(C)/ *Haemophilus influenzae*	1	1
9.	(B)/ DNA ligase	1	1
10.	(C)/ Hybrid : Heavy, 1 : 31	1	1
11.	C/	1	1
12.	(B)/	1	1
13.	(D) / Assertion (A) is false, but Reason (R) is true.	1	1
14.	(C)/ Assertion (A) is true, but Reason (R) is false	1	1
15.	(A) / Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).	1	1
16.	(B) / Both Assertion (A) and Reason (R) are true, but Reason (R) is *not* the correct explanation of the Assertion (A)		
	SECTION - B		
17.	Amniocentesis is very useful in detecting chromosomal disorder in fetus, as it is misused for female feticides so there is a ban on Amniocentesis	1+1	2
18			
	(a) - Set up A, - DNA fragments being negatively charged move towards the anode on applying the electric field	½ ½	

	(b) - I		½	
	- Smaller fragment will move faster as compared to longer fragments of DNA/ longer fragments will move slower as compared to smaller fragments of DNA.		½	2
19.	(a) 8 amino acids, genetic code is read in triplets and there is no change in the number of triplets/ no change in reading frames.		½ x 2	
	(b) 3 amino acids, the 4th codon now reads as UGA – a stop codon		½ x 2	2

20.	(a) Humus – Dark coloured, amorphous, highly resistant to microbial activities, undergoes decomposition at slow rate, colloidal, reservoir of nutrients. (Any four features)
	
	OR
	
	(b)
	  (i)
	
	  (ii) Log S = Log C + Z Log A
			½ x 4
			
			1
			
			1
				
				2

21.	• Vaccine is a preparation of antigenic proteins of pathogen or inactivated/weakened pathogen. • It is based on the property of memory of immune system, the antibodies produced in the body in response to these antigens would neutralize the pathogenic agents and body will show amnestic or quick response		1 ½ x 2	 2

<table>
<tr><td colspan="4" align="center">**SECTION - C**</td></tr>
<tr>
<td>22.</td>
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T.S. of mature anther   Epidermis
Endothecium
Middle layers
Tapetum

(Note: Epidermis/Endothecium, middle layers, Tapetum each carry ½ mark)

Function of first 3 layers– Protection, dehiscence of anther,

Innermost layer Tapetum provides nourishment to the developing pollen grain.
</td>
<td>

½x 3

½+½

½
</td>
<td>

3</td>
</tr>
<tr>
<td>23.</td>
<td>

(a) Hardy – Weinberg Equilibrium.

$P^2 + 2pq + q^2 = 1$
AA + 2Aa + aa = 1

Since Frequency of grey snakes in the population = 9% = | 9/100 =0.09 |

q2 = ·09
q = 0·3
Since p + q = 1
p = 1 – q
p = 1 – 0·3
p = 0·7

The frequency of homozygous dominant (AA) is equal to $P^2 = 0.49$

Or   the % frequency of homozygous dominant = 49%

The frequency of hetrozygous dominant (Aa) is equal to

2pq = 2 × 0·7 × 0·3 = 0·42 Or % frequency of Aa = 42%

(b) Natural selection
</td>
<td>

½

½

½

½

1
</td>
<td>

3</td>
</tr>
</table>

24.	(a)				
	(i) -Cow dung has methanogens or *Methanobacterium*				1 x 2
	-Cow dung is rich in cellulosic material				
	-Bacteria grows anaerobically on cellulosic material to produce large amount of methane. **(Any two points)**				
	(ii) Used as manure/ fertilizer (Organic)				1

OR

		Bioactive molecule	Microbial source	
(i)	Myocardial infarction	Streptokinase	*Streptococcus*	½ x 2
(ii)	High blood cholesterol level	Statins	*Monoascus purpureus*	½ x 2
(iii)	Organ transplantation	Cyclosporin A	*Trichoderma polysporum*	½ x 2
				3

25.		Spermatogenesis		Oogenesis	
	(i)	At onset of puberty	(i)	In foetal life	1
	(ii)	Four	(ii)	One	1
	(iii)	Within the seminiferous tubules of the testis	(iii)	In the fallopian tube when the sec. oocyte gets contact with the sperm	1
					3

26.	(a) **1 mark is to be awarded to all the students if attempted**,	1
	(b) Violet, axial × White terminal	1
	Parents are heterozygous dominant × homozygous recessive. VvAa × vvaa	
	(c) Violet axial × Violet, axial	
	heterozygous for flower colour and homozygous dominant for flower position VvAA × VvAA	1
		3

27.	– Conduit of energy in the ecosystem. Example: Grass-Goat- Lion / Lion (Predator) transfer the energy fixed by plants in the ecosystem (or any other example) – Maintain species diversity of prey by reducing intensity of competition.	½+½ ½+½

	Example: Extinction of more than 10 species of invertebrates due to removal of starfish *Pisaster* (Predator) (or any other example) –Keep the population of prey under control Example: Cactus feeding Moth (predator)controls the spreading of prickly pear cactus. (or any other example)	½+½	3
28.	*(a)Bacillus thuringiensis* (b) GM cotton crop contains *Bt* toxin protein which exists as inactive protoxins, but once bollworm ingest the inactive toxin it is converted into an active form due to the alkaline pH of the gut of the worm, which solubilizes the crystals of the prototoxin, activated toxin binds to the surface of the midgut epithelial cells of the worm and creates pores that cause swelling and lysis and death of the insect caterpillar.	1 ½x 4	 3

SECTION - D

29.	(a) • 3/Three fragments	½
	•	
	5′ – C – C – G – T – A – G 3′ | | | | | | 3′ G – G – C – A – T – C	
	5′ – C – T – A – T – C – A – G 3′ | | | | | | | 3′ – G – A – T – A – G – T – C 5′	½
	5′ C – T – G – G – 3′ | | | | 3′ G – A – C – C – 5′	
	(b) • Alu I , Alu I site is present in the given sequence and BamH I site is not given.	½+½
	(c) • Sugar phosphate backbone • Palindrome sequence / recognition site/ restriction site	1 1
	OR	
	(c) 5′ G-A-A-T-T-C 3′ 3′ C-T-T-A-A-G 5′	2
	(Note : 1 mark for polarity and 1 mark for correct sequence)	4

30.	(a) - Rwanda – very broad base of Rwanda's age distribution indicates a rapidly growing population/ population explosion/ Increasing population/ expanding population. - Because large number of individuals are in pre-reproduction age group. (b) It indicates that number of individuals in pre-reproductive and post-reproductive age groups are same. (c) Declining age pyramid. OR (c) Expanding age pyramid.	1+1 1 1 1	 4

<div align="center">**SECTION - E**</div>

31.	(a)
	- The plasma membrane of the red blood cell has sugar polymers that protrude from its surface and the kind of sugar is controlled by the gene I present in blood.
	
	- The gene (I) has three alleles I^A I^B and i
	
	- The alleles I^A and I^B produce a slightly different form of the sugar.
	
	- I^A and I^B are completely dominant over i
	
	- When I^A and I^B are present as in AB blood group they both express their own type of sugars and show codominance.
	
	(Note: Marks to be awarded if the above points are represented in the form of a table or cross)
	
	 OR
	 (b)
	
	  (i) Switching 'on' of the lac operon
	
	 -The lac operon consists of one regulatory gene and three structural genes (z, y and a)
	
	 -The i gene codes for the repressor of the lac operon
	
	 -The Z gene codes for beta – galactosidase (β – gal)
	
	  (βeta galactosidase is responsible for hydrolysis of (disaccharide) lactose into galactose and glucose)
	
	 -y gene codes for permease (which increases the permeability of the cell to β-galactosides/lactose)
	
	 -The repressor protein binds to the operator region and prevents RNA polymerase from transcribing the operon
	
	 -Lactose is the inducer and regulates switching on and off of the operon
	
	 -In the presence of inducer, lactose or allolactose, the repressor is inactivated by interaction with the inducer
		
		1 x 5
		
		½x8	

-This allows RNA polymerase to access the promoter and transcription proceeds

/

½x8
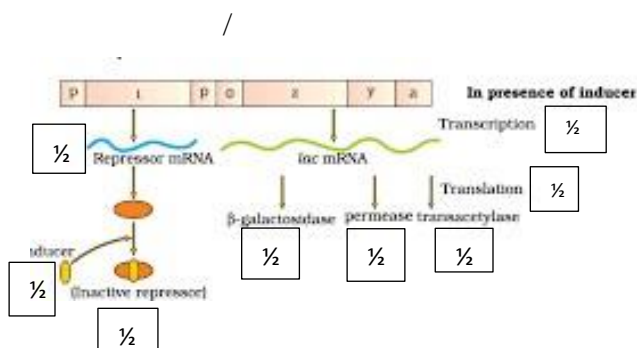
(ii)   Repressor binds to the operator to inhibit gene expression therefore it is referred to be negatively regulated.
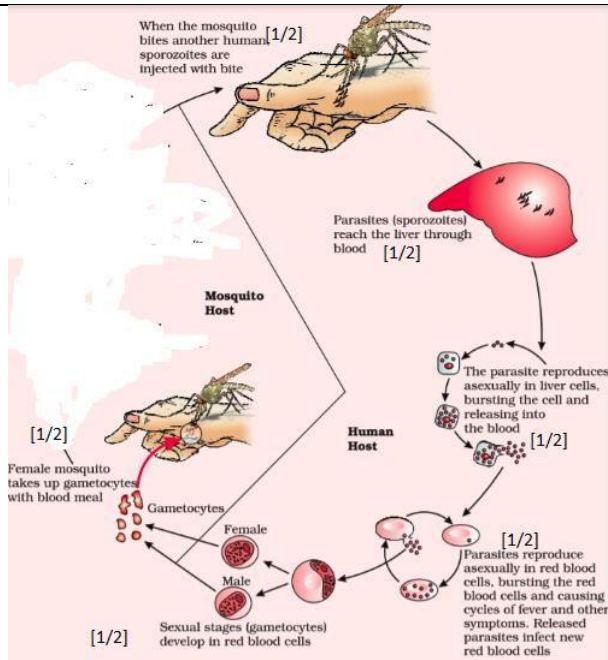
1

5

| 32. | (a) (i) Life cycle of the *Plasmodium* from the period it enters the human body till a female Anopheles mosquito bites an infected person.
-*Plasmodium* enters the human body as sporozoites (through the bite of infected Anopheles mosquito)
-The *plasmodium* reproduces asexually in the liver cells initially;
-And then on releasing it in blood to attack the Red Blood cells (RBCs)
-Parasite (plasmodium) reproduces asexually in Red Blood cells (RBCs)
 -Resulting in rupture/ bursting of the RBCs
-Several sexual stages (gametocytes) develop in RBCs
-Female Anopheles mosquito takes up gametocytes with blood meal.

/ | ½ x 6 | |

When the mosquito bites another human [1/2] sporozoites are injected with bite

Parasites (sporozoites) reach the liver through blood [1/2]

Mosquito Host

The parasite reproduces asexually in liver cells, bursting the cell and releasing into the blood [1/2]

Human Host

[1/2] Female mosquito takes up gametocytes with blood meal

Gametocytes

Female

Male

[1/2] Sexual stages (gametocytes) develop in red blood cells

[1/2] Parasites reproduce asexually in red blood cells, bursting the red blood cells and causing cycles of fever and other symptoms. Released parasites infect new red blood cells

½ x 6

(ii) - Fertilization of male and female gametocytes,
-production of sporozoites,
-migration of sporozoites into salivary glands of mosquito

(Any two)

1+ 1

OR

(b) (i)

Malignant cancer	Benign Cancer
1) Mass proliferating cells called neoplastic or tumor cells grows rapidly. 2) It spreads to other parts of the body or causes metastasis. 3) Invading and damaging the normal tissues	1) Tumor cells grows slowly 2) It is confined to their origi location, or causes no metastasis 3) Causes little damage in th tissue

1 +1

(Any two corresponding differentiation points)

(ii)
- Biopsy and/histopathological studies- a piece of suspected tissue or blood orbone marrow cut into thin section is stained and examined by pathologist.
- Radiography- use of X-rays,
 CT -Computed tomography to generate 3-dimensional image
 of the internal organs by using X-rays.
-MRI- uses strong magnetic field and non ionising radiations to accurately detect pathological and physiological changes in the living tissue.
-Antibodies against specific antigens are used for detection of certain cancer.

1+1+1

	- Technique of Molecular Biology applied to detect genes in an individual with inherited susceptibility to certain cancer. **(Any three techniques)**	5

33.	

(a) (i) - Pollen release and stigma receptivity are not synchronized/ Either the pollen is released before the stigma becomes receptive or stigma becomes receptive much before the release of pollen.
- Anther and the stigma are placed at different positions so that pollen cannot come in contact with the stigma of the same flower.
- Self-incompatibility/genetic mechanism/prevention of self- pollen from fertilizing the ovules by inhibiting pollen germination or pollen tube growth in the pistil.
- Production of unisexual flower.

1x4

(ii) To prevent inbreeding depression/ to have more variations for better adaptation.

1

OR

(b) Menstrual cycle in a normal human female

		Uterine event	Ovarian event
(i)	Proliferative phase/ Follicular phase	Endometrium of the uterus regenerates through proliferation under the influence of estrogen follicles.	Primary follicles in the ovary grow to become Graafian follicles under FSH. (Secretion of estrogens by the growing follicles).
(ii)	Luteal phase/ Secretory phase	Maintenance of the endometrium (thickness) in the presence of progesterone.	Ruptured Graafian follicle transforms into corpus luteum. (secretes large amounts of progesterone).
(iii)	Menstrual phase	Breakdown of the endometrium lining of the uterus in the absences of progesterone from Corpus luteum.	Primary follicles start maturing and developing in the ovary under the effect of FSH.

1+1

1+1

½+½

5